

**Gladstone Treatment Plant Assessment
A Targeted Brownfield Assessment Project Proposal**

PROJECT TITLE: Gladstone Treatment Plant Assessment

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Site/Project Location: Gladstone, Cement Creek Watershed, San Juan County, Colorado. See Vicinity Maps 1 & 2 of Appendix A.

Gladstone is the site of an historic mining town that developed in the 1880s with the advent of mining in the surrounding area. The town declined in the 1920's, and today there are no remnants of the town. A few mills operated on the edges of the town; some tailings were deposited in the abandoned town site. The last operating mill in Gladstone closed in 1950's. Mining activities continued sporadically in the immediate Gladstone area until the early 1990s. The largest mine in the Animas Mining District was the Sunnyside Mine that closed in the 1990s and is now nearing completion of final reclamation. The Gold King Mine is currently in inactive status. Both these mines were partially accessed through the American tunnel that has its portal in Gladstone. Bulkheads were placed in this tunnel to stop water discharges. There continues to be a small discharge (<100GPM compared to the peak discharge of 1,600 GPM) from the tunnel that is thought to be near surface groundwater.

This Targeted Brownfield Assessment (TBA) project includes assessing locations for their potential use as a modern, centralized water treatment facility. Treatment plant location analysis will be limited to 20 to 100 acres in the vicinity of Gladstone. The TBA project will also assess the practicality of conveying and actively treating acidic mine drainage from several draining mines in the vicinity of Gladstone. Draining mines and easements for pipelines to transport drainage to the treatment plant may involve as many as 100 acres in less than a three square mile area.

Several sites including the American Tunnel, Evelyn, Gold King, Mogul, Grand Mogul, Joe and John, and Red and Bonita mines, are ranked as high priority, low volume/high metal concentration acid mine drainages that need to be considered for inclusion in a treatment facility. In addition, there is the possibility of treating water from Cement Creek that is contaminated by natural processes and mines further upstream. The existing but currently idle lime feed treatment plant treated only the American Tunnel, the Gold King discharge and, at times, upper Cement Creek.

Currently numerous mine claims in close proximity of Gladstone are property tax delinquent. Many individuals and some corporations have let their property go to tax sale so they don't have the liability associated with mine wastes and

drainages. Current assessment values of the claims are minimal since they are assessed as vacant mine lands only (the lowest valuation category in the State). If discharges were treated the values could increase substantially as they would become desirable for residential and/or commercial/industrial development. All mine drainages considered for treatment are within one and one half miles of the new and expanding Silverton Mountain ski area.

Site History and Current Status

This TBA project involves assessment for pollution reduction of several mine drainages from patented mine claims and the ghost town of Gladstone in the Cement Creek watershed, San Juan County, Colorado. Numerous historic, now abandoned, mines exist within a two mile radius of Gladstone. A few of these mines have acid mine drainage flows between 30 and 100 GPM containing very high concentrations of acid and dissolved metals. Gladstone has historically been the central location, and railroad terminus, for the milling and shipping of mine ores from this three square mile valley. In the 1960's the American tunnel was extended another mile out of Gladstone, beyond Gold King property, to access the Sunnyside Mine from below. The tunnel drained up to 1600 GPM from the mine. All ore from the American tunnel was transported out of Gladstone until the mines closure in 1991. Milling had already ceased in Gladstone before the 1960's and after that Sunnyside ore was transported to the Mayflower mill near Silverton. Sunnyside Gold Corporation (SGC) has removed all mine wastes and tailings that will be removed under their MLR permit. Removal of buildings, grading, and planting remain to be accomplished this summer.

The existing lime feed and settling pond type treatment facility was constructed in Gladstone in 1979 by Standard Metals Corporation. The facility served to treat water discharging from the American Tunnel, the main access into the Sunnyside Gold mine, as required by their water discharge permit. The facility operations and mine ownership was later transferred to the Sunnyside Gold Corporation. Under jurisdiction of a court consent decree to terminate their discharge permit, SGC installed several bulkheads within the Sunnyside Mine which has greatly reduced the amount of discharge out of the American tunnel. Seventy to 100 GPM continues to discharge presumably from near surface, "natural" ground water flows. All terms of the consent decree were met by SGC. In January of 2003 the treatment facility, operations, and permit were transferred to Gold King Corp., which actually owns much of the land intersected by the American tunnel. Gold King continued to operate the treatment facility, treating the remaining American tunnel discharge and adding the Gold King discharge, until September, 2004. Due to financial problems and the loss of the leased use of the property the settling ponds resides upon, Figure 1, Gold King terminated treatment of the discharge. The treatment plant is presently sitting idle for lack of funds to develop an adequate method to separate and dispose of the metal precipitates (sludge). Capitalization is needed for both a metal precipitation and concentration plant and continuous long term operation.

Figure 1: Gladstone Treatment Plant - Settling Ponds



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Figure 2: Gladstone Treatment Plant - Limefeed



Discharge from the American tunnel is now considered non-compliant and the existing, second generation lime treatment plant, Figure 2, may or may not be adequate for future use depending upon the results of this TBA engineering analysis for a modern and complete process. Gold King Corp. has no financial ability to operate the plant and the properties containing the lime feed plant and settling ponds have been foreclosed upon, subject to a redemption period.

Cement Creek, the receiving stream for the discharge of the American tunnel and other draining mines in the immediate area is unable to support aquatic life and only ambient water quality standards apply. Cement Creek is a major contributor of metals and acidity to the Animas River which has "goal-based" cold water aquatic life I standards. Presently 15 TMDL's are not being met in Cement Creek and the Animas River below Cement Creek's confluence. Cement Creek is the primary remaining target for metals and acidity reduction, necessary to bring the Animas River into Clean Water Act compliance.

Technology for active treatment plants has advanced in recent years. If newer technologies were employed improvement in cost efficiency of treatment and especially disposal of the American tunnel sludge could be realized. For instance, using the present lime feed system combined with a new smaller settling area, thickener, and filter press, a low volume solid brick of precipitates could be produced that could be disposed of in a more affordably way, such as in a landfill. The previous system hauled the sludge, containing 98% water, to an open tailings pond which is no longer available. An important objective of this TBA is to design a plant that will maximize metal removal at minimal costs.

Due to the non-compliant status of the existing dormant treatment plant, various property owners, San Juan County, and Animas River Stakeholders Group (ARSG) participants are anxious to re-establish adequate treatment. The close proximity of the plant to other high impact draining mines and the necessity to meet downstream water quality standard goals provides a significant opportunity for a collaborative approach that could be enormously beneficial to the entire watershed, including aquatic resources, recreational users, fisherman, irrigators, and the municipal water users of Durango, CO and Aztec and Farmington, NM. A modernized treatment plant in the vicinity of Gladstone is likely to be the most cost efficient method of reducing metal and acidity loading to the Animas River watershed. The proposed TBA would determine the feasibility of the concept of potentially combining drainages of several mines for treatment plus possible treatment of upper Cement Creek, technologies to be used, preliminary plant design, land acquisitions (if any) required, and capitol and operating costs.

No CERCLA or RCRA response action has been taken on any of the sites.

Property Specific Determinations

The Animas River Stakeholders Group (ARSG) has characterized and ranked all draining mines throughout the Animas River watershed with respect to one-another by their metals and acidity contributions. Several of the worst polluters of metals and acidity were found to be in the vicinity of Gladstone and would be considered as drainages for treatment in this assessment. Characterization analysis and feasibility for remediation determinations have been compiled in the Animas Use Attainability Analysis¹ by the ARSG.

Contamination by Petroleum or Petroleum Product

No known petroleum or petroleum product contamination exists on the current treatment site. Remaining sludge in the treatment settling ponds will be removed by SGC in 2005.

While metal contamination in Cement Creek is high, it is due to a combination of natural geological processes and acid mine drainage from mines in the vicinity of Gladstone. Contamination from metal mine processing (mine waste and mill disposals) in Gladstone is considered low to moderate. Sunnyside Gold Corporation (SGC) has already removed tens of thousands of tons of historical mine tailings and mine wastes and disposed of them in Tailings Pond #4 of the Mayflower Mill. In 2005 SGC will complete their permitted remediation by removing the sludge in the settling ponds and potentially some buildings in order to terminate their discharge permit. Although operators responsible for remaining mine discharges and low level contamination do not exist, land owners and participants in the ARSG process are interested in collaborating to find a practical way to make further improvements.

San Juan County, the sponsoring agency, is not liable for any contamination on the site.

Project Period and Budget

This project will begin soon after EPA approval of the TBA technical support. ARSG has currently scheduled a special Remediation Work Group meeting for May 19, 2005 to complete the development of objectives and tasks for the assessment which will be provided to EPA and the chosen contractor. Appendix C, Draft Objectives and Tasks, lists project objectives and task; however these need to be further refined as many of the tasks have been partially or wholly completed.

Some of the initial assessment must be accomplished in the field. Field season at this high elevation site is restricted by heavy snow accumulations and avalanches. Field work is generally limited to May or June through October, depending upon seasonal conditions. All other project tasks can be accomplished in the office. The assessment and final report should be completed by July, 2006.

¹ Simon, Wm., Butler, P., and Owen, R., 2001. Animas Use Attainability Analysis.

Budget:

Description	Estimated Amount
Contractual	140,000
Supplies and Laboratory Fees	10,000
Other: State Audit, accounting, billings, reporting	10,000
TOTAL	\$160,000

Assurance of Future Redevelopment and Reuse of the Site

The site for the treatment plant needs to be determined. The plant will likely be located on private and/or public lands associated with a draining mine. Any and all mine drainages piped into the plant will benefit from treatment. Therefore land values on the patented mining claims will increase and property owners will be able to use the property for development purposes whereas presently the liability associated with mine drainage inhibits investment.

A mix of public and private ownership presently exists on the American tunnel treatment site. Adding additional drainages from surrounding mines adds more complexity. During the period of this TBA, the BLM and San Juan County have agreed to simultaneously complete an investigation on various legal aspects of ownership and future operation of the treatment facility. We anticipate a trust organization or a quasi-public entity such as a special improvement district will own and operate the facility. The legal investigation will make recommendations on this critical aspect of the project.

San Juan County leads this TBA project; providing administrative oversight, project management, and a public forum. The Animas River Stakeholders Group has initiated this project and will remain as key advisors to the Board of County Commissioners, the County Administrator, and the TBA contractor. ARSG has developed a list of objectives and tasks, to be refined in May, 2005 that will focus the efforts of the chosen contractor. Through monthly public meetings the ARSG will provide valuable public education and an avenue for public input. The BLM, Colorado Division of Minerals and Geology (DMG), and Colorado Water Quality Control Division (CWQCD) among other local, State, and Federal agencies are active ARSG participants who will contribute expertise and project oversight and focus (Appendix A).

This TBA project has been openly discussed for several months at ARSG and Board of County Commission meetings. Our local newspaper has also reported on this proposal. Environmental advocacy groups and downstream water users are aware of the problems faced with the treatment plant being inoperative and will insist that positive steps be taken to bring discharges into compliance.

Although most funding sources will need to be identified after the feasibility determination, it is anticipated that many entities will need to be involved. The

BLM has recently requested \$3 million for treatment plant development and operation. Presently the BLM and San Juan County are committed to accomplish the legal assessment. The existing lime feed treatment facility, Figure 2, could be donated to the cause if we can act quick enough that it is not torn down as a requirement of the existing permit with DMG.

Benefits

- 1) Increased property valuations from decreased contamination and liability from draining mines on the project and adjacent lands.
- 2) Reduced metal and acid loading to Cement Creek and the Animas River. An active treatment plant may presently be the most cost effective method of treating high concentration, low volume acid mine drainage. The possibility of treating several mine drainages in one unit, plus perhaps waters from Cement Creek, would be a significant step in the effort to meet TMDL's and water quality standards.
- 3) Significant health benefits would result from reduced metal concentrations for drinking water users in Durango, CO, and Aztec, Flora Vista, and Farmington, NM.
- 4) Development of a long term secured treatment facility would free other potentially available lands for commercial/residential development near the base of Silverton Mountain Ski Area. A substantial increase in winter recreational/tourist use would result.
- 5) Public lands would benefit from reduced metals pollution to area streams and wetlands. Aquatic life and aesthetic values would increase. Treatment of acid mine drainage would help restore the integrity, functions, and water quality of receiving streams and adjacent wetlands.
- 6) Cement Creek at Gladstone has been targeted by the San Juan Planning Commission as a development corridor. San Juan County and Silverton Mountain Ski area, which is adjacent Gladstone, are involved in trail development in the corridor as well. The County has little room elsewhere to grow as this valley bottom is one of the few locations in the county that are accessible by motorized vehicles. The County, ARSG, and Animas Conservancy are presently investigating potential conservation easements for on patented mine claims throughout the County and a newly formed Red Mountain Light Task Force has formed to put some private lands back into the public sector.
- 7) San Juan County is the poorest in the State and has the highest unemployment. This project will eventually provide local construction, operation, and maintenance opportunities.
- 8) Redevelopment could potentially include future mining activities as well. Mining redevelopment could lead to further abandoned mine land restoration and perhaps assistance with treatment plant operation.

APPENDIX A
PARTICIPANT LIST
of the
ANIMAS RIVER STAKEHOLDERS GROUP

Federal Entities

Bureau of Reclamation
Bureau of Land Management
U.S. Forest Service

U. S. Geological Survey
Army Corps of Engineers
U. S. Environmental Protection Agency

Colorado Agencies

Division of Wildlife
Division of Minerals and Geology
Colorado Department of Public Health and
Environment
Colorado Riverwatch Program

Local Agencies

Southwestern Water Conservation District
San Juan Resource, Conservation and Development
Town of Silverton
City of Durango
San Juan County

Citizens Groups

San Juan Citizens Alliance
Western Colorado Alliance
River Watch Network, Inc.
Taxpayers for Animas River
Colorado River Alliance
San Juan County Historical Society

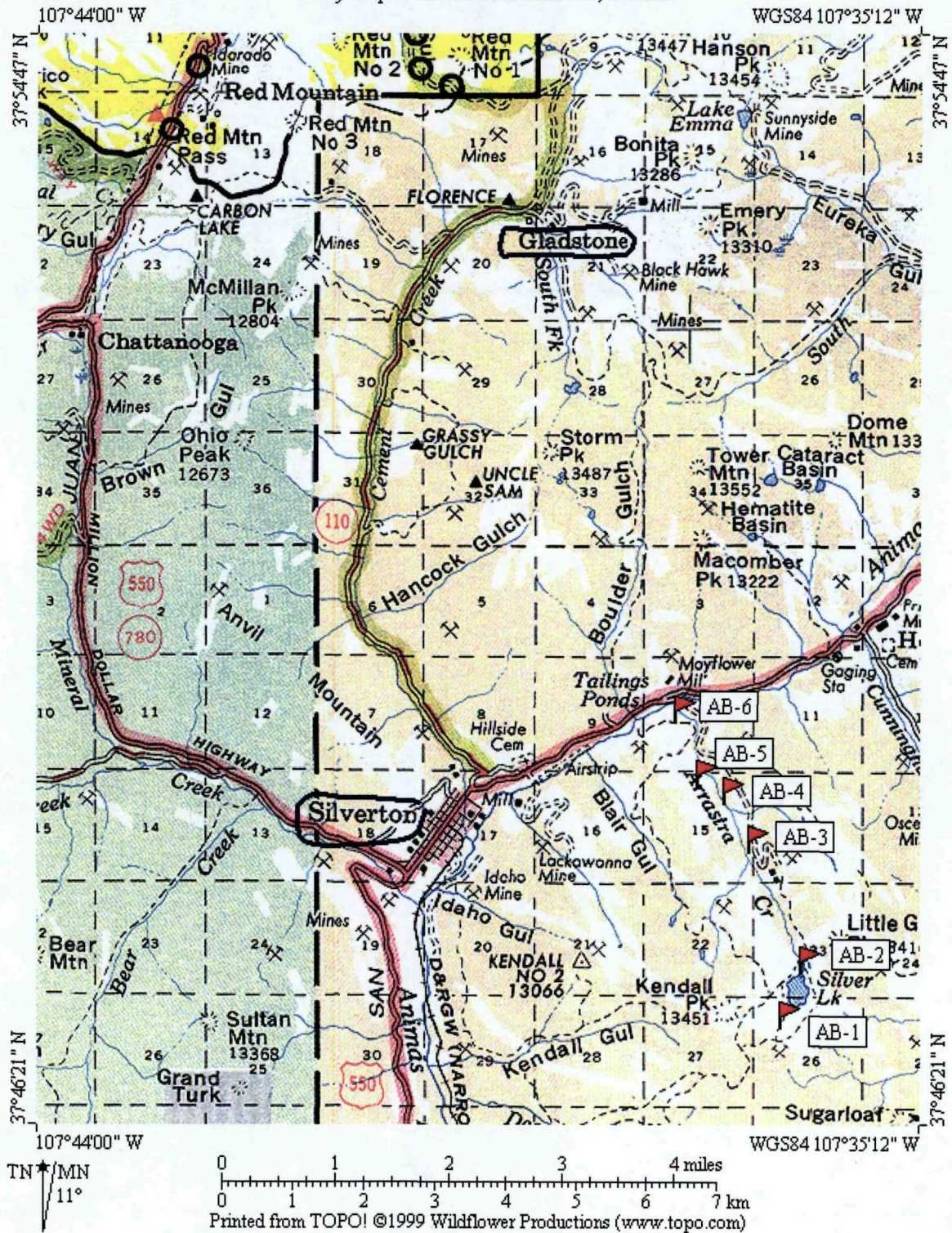
Private Entities

Gold King Mining Co.
Root and Norton Assayers
Silver Wing Co., Inc.
Howardsville Mill
Echo Bay Mining
Salem Minerals
Tusco, Inc.
Sunnyside Gold Corp.
Durango and Silverton Narrow Gauge Railroad
Mining Remedial Recovery Company
Alpine Environmental Service

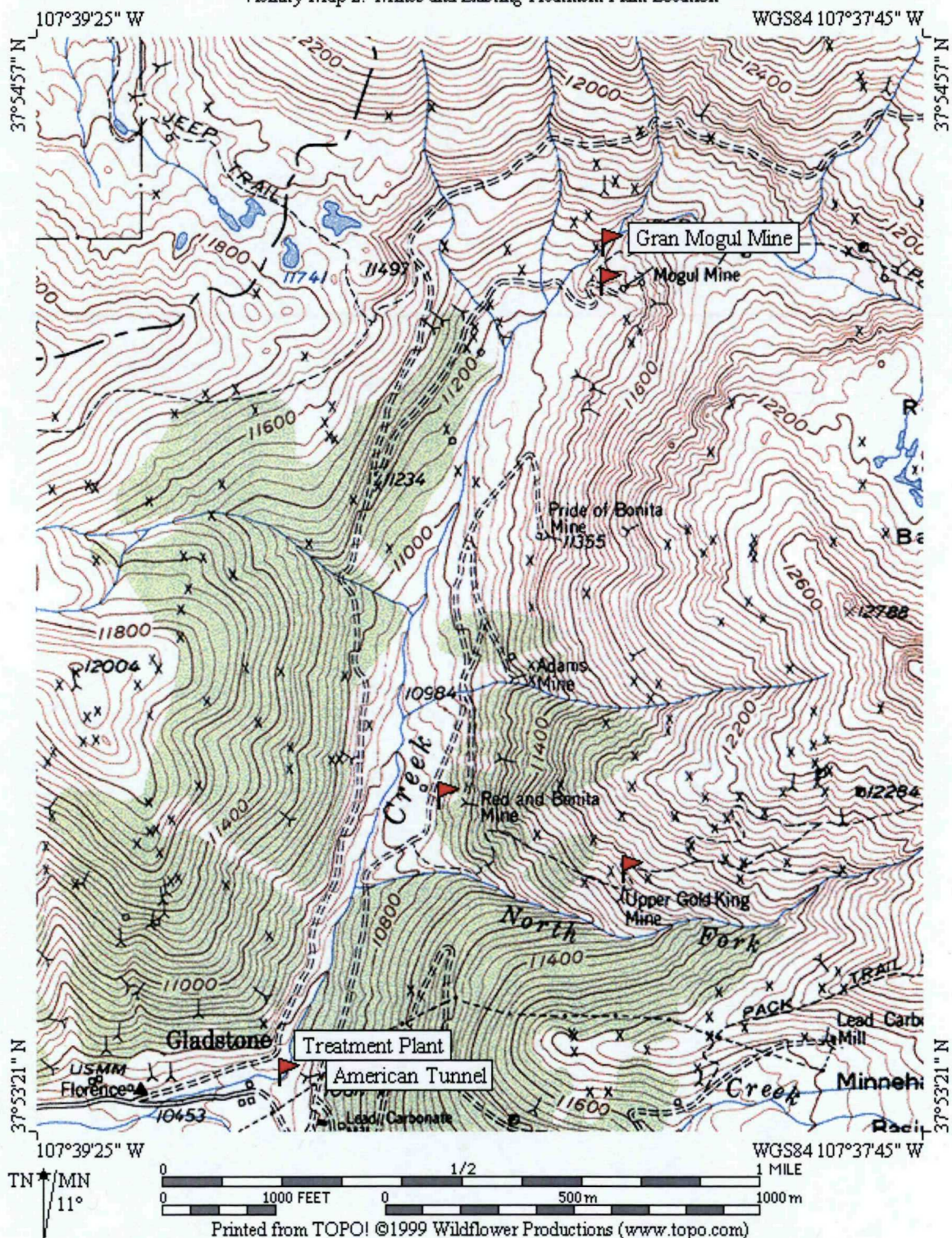
Plus numerous citizens from Silverton, Durango, and absentee property owners from throughout the nation

APPENDIX B

Vicinity Map 1: Silverton and Gladstone, Colorado



Vicinity Map 2: Mines and Existing Treatment Plant Location



APPENDIX C

Objectives and Tasks

For

Gladstone Water Treatment System Modernization Options

Introduction

Based on the history of past operations, operators, and metals reduction at the discharge point and at the Cement Creek gauging station (CC48) in Silverton, the U.S. Environmental Protection Agency (EPA), Bureau of Land Management (BLM), and the Animas River Stakeholders Group (ARSG) would like to assist San Juan County in a technical and legal feasibility study for restructuring and rebuilding a treatment plant that might not only treat the remaining discharge from the American Tunnel but also from other mines in the area, particularly the Gold King, Red and Bonita, Mogul, and Gran Mogul.

It was determined that BLM would look into the legal operation and ownership issues of a treatment plant. BLM has recently been found to actually own the portal entrance of the American tunnel.

OBJECTIVES:

The Gladstone Water Treatment System TBA objectives are:

- Compile available literature, history, water quality data, and mine drainage data and surface ownership maps.
- Provide a technical assessment of the effectiveness and efficiency of the existing lime fed water treatment system;
- Identify and evaluate the pros and cons of an alternative system, including alternative locations;
- Provide conceptual designs for alternative systems and alternative locations, including sludge disposal sites;
- Evaluate the feasibility of different treatment systems versus cost ranges to maximize metal removal at minimal cost (capital needed and long-term operations and maintenance).
- Consider the costs and benefits that a water treatment facility would have on the Cement Creek Redevelopment Corridor and water quality and aquatic habitat improvements would have on the Animas Watershed
- Identify corridors for piping mine discharges to the treatment plant,
- Make suggestions of potential sources of funding for construction and O & M;
- Determine a monitoring plan and schedule for implementation

Specific Tasks to support the Gladstone Water Treatment System TBA objectives may include the following. Details of each task are listed below.

Tasks

Task 1: Collaborate with San Juan County, Animas River Stakeholders Group and other stakeholders.

Task 2: Complete a Work Plan/Cost Estimate; refine Objectives and Tasks.

Task 3: Collect and Present Background Information and Available Data

Task 4: Site Reconnaissance

Task 5: Develop Conceptual Site Model

Task 6: Preparation of Report and Matrix showing design alternatives versus costs

Task 7: Assist Applicant/County and ARSG, with Outreach and Community Involvement

Task 8: Data Management, Reports, and Project Closeout

Tasks with details

Task 1: Collaborate with San Juan County, Animas River Stakeholders Group and other stakeholders.

- Identify and clearly document County's redevelopment plans and existing scenario(s) the County supports for the Cement Creek Redevelopment Corridor and details specific to the Gladstone Site and the re-development of a treatment plant.
- Identify and clearly document private stakeholders' roles and responsibilities
- Identify where ARSG can assist with data collection, monitoring, information compilation, access to sites, and land ownership
- Contact private landowners for access and additional site information, as needed..
- Identify TBA site boundaries for Gladstone Water Treatment System. **NOTE:** This may include other lands identified as possible alternative sites for relocation of a Water Treatment System. This may also include collection of other metals-laden seeps and adit drainage from other mines.
- Identify water treatment goals as they relate to the long-term Animas River water quality improvement objectives.

Many of the above tasks have been accomplished, at least in part, and can be most easily done by ARSG participants. For this reason, it would be most practical to involve the ARSG as sub-contractors.

Task 2: Complete Work Plan/Cost Estimate

- Phase III activities
- Compile available Information and Data. Evaluate the accuracy and completeness of available information and determine if additional data are needed.
- Determine in cooperation with the State and other stakeholders the Wasteload allocation to be used for plant design. (goal setting).
- Field Reconnaissance
- Staffing
- Estimate Analytical Costs (may not apply; if applies, may be able to use EPA Region 8 lab for inorganic analyses. This would not include ultra low-level mercury analyses.)
- Evaluate existing Water Treatment System
 - Evaluate design, location, and feasibility of different options for an alternate technology. (Note: basically an EE/CA)
 - Development of cleanup/remediation and sludge disposal needs.
 - Preparation of Report and Matrix showing design alternatives versus costs

Task 3: Collect and Present Background Information and Available Data

- Document historic and recent mining history as it relates to the Gladstone water treatment system. Include status of mine reclamation permit and NPDES permit
- Collect available data from ARSG water quality data base for Cement Creek and the draining mines of interest. Determine if other agencies or private owners have additional data that will support TBA study questions for the Gladstone Water Treatment System Phase III Options/Cost Analysis Plan.
- Evaluate Katie Walton Day's (USGS) metal reduction modeling for Cement Creek
- Document known and potential hazardous substances located on site that may not have already been characterized, or have been potentially released from source area(s). If applicable, include descriptions of PCBs (transformers?), processing chemicals at Gladstone, and possible petroleum issues.
- Present applicable existing data for surface water, groundwater, mine sources, targets/receptors (bugs/wetlands/sensitive plant and animal species).
- Identify data gaps that require more sampling or other phases of study
- Evaluate QA/QC of data
- Organize any new data for addition to STORET and ARSG database.

Task 4: Site Reconnaissance

- Conduct site visit with appropriate stakeholders/landowners
- Evaluate condition of existing water treatment system
- Determine what additional water quality data are needed from streams and draining mines

- Identify expected types, volumes, and ranges of concentrations of contaminants from mine sources to be treated by a modernized system
- Conduct an evaluation of alternative locations and methods of treatment for a modernized system
- Review monitoring location and data to understand the effectiveness of the previous treatment plant at the discharge point and at the Cement Creek gauge (CC48).
- Identify existing wetlands and potential locations for created wetlands to improve the water treatment system ???

Task 5: Develop Conceptual Site Model

- Relate goals to the long-term Animas River 'goal based' water quality standards and TMDL's
- Develop or use previous Sample Analysis Plans, Quality Assurance Plans, and Data Quality Objectives.
- Determine the number, sources, and volumes of discharges (Cement Creek and discharging mines) that can be efficiently treated
- Determine the capacity of the plant and sludge volumes in need of disposal (we anticipate that a nearly dry product will need to be produced to keep disposal costs minimal).
- Determine water quality discharge goals for the treatment plant
- What is the total volume of water to be managed and treated if other sources are included. (Gladstone ponds have 2.1 millions gallons capacity
- For alternative location(s), could environmental or human health targets be impacted?
- Is the site appropriate and safe for redevelopment / reuse as planned by the County/TBA Applicant?
- What are the best design (and possible location(s) alternatives for the Gladstone system?
- Attend monthly ARSG meeting for public input
- Determine monitoring needs

Task 6: Preparation of Report and Matrix showing design alternatives versus costs

- Develop and distribute draft and final Phase III Options vs Cost Analysis Plan
- Submit to applicant (San Juan County); ARSG; landowners; other interested stakeholders, and EPA for review and comment
- If data are collected, include applicable QAPP elements and document 7 Step Data Quality Objectives Process to obtain usable data that meet the study objectives.
- Revise and finalize based on stakeholder comments
- Attend ARSG meetings to discuss the final document

Task 7: Assist Applicant/County and ARSG, with Outreach and Community Involvement

- Attend ARSG meetings during the project performance period
- Determine which lands need other support and type support needed.

Task 8: Data Management and Project Closeout

- Get new data into STORET and other databases for stakeholder use
- Ensure Applicant and other stakeholders have access to information generated during TBA by linking work products to the County or ARSG webpage.
- Work Assignment Closeout